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THE LIMITS OF TECHNOLOGICAL TALK

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Applied behavior analysts and behavior therapists have long prided themselves on their technological precision and methodological sophistication. Some even go so far as to *define* the field on the basis of its commitment to the "specification of treatment in operational . . . terms" (Kazdin & Hersen, 1980, p. 287). This emphasis is a proud component of the behavioral tradition, but along with it has come a deemphasis of theoretical and philosophical concerns.

Science can be divided into four levels of increasing scope (Hayes, 1978): technique (how to do it), method (how to know it has been done), theory (how to talk in a systematic fashion), and philosophy (assumptions about how to view the world). The first 10 years of *JABA* were characterized by an increasing loss of interest in theoretical development, even to the point of a failure to speak of interventions in terms of known principles (Hayes, Rincover, & Solnick, 1980). This trend, although it may have moderated somewhat, has seemingly not reversed in the last 10 years. Technological talk has occurred in a verbal vacuum, often without systematic efforts to connect a given finding with anything else.

In the current issue, the Editor of *JABA* has asked if we are technological to a fault. It is a good question. My answer is yes, in the sense that too many have felt that technology and method alone can serve as a basis for the development of the field.

WHAT ARE THE PRODUCTS OF RESEARCH?

The direct product of science—even at the level of technique—is words. The actual technique of, say, a token economy cannot be given away in a scientific sense. This is part of what distinguishes science and other areas such as craft or art. What is communicated in our research journals are words *about* this technique. Scientists, in that sense, are word makers. This observation, although obvious, has important implications.

The Meaning of Method

Viewing scientists as speakers casts a different light on their methods and analytic practices. These can be viewed simply as a means of refining and restricting sources of control over scientific talk. For example, behavior analysts commonly ask speakers to "show me your data." That is, there is an insistence that verbal formulations of relations among events be based on direct and verifiable contact with these phenomena. Similarly, editors and others may ask for the relevant reliability coefficients covering a given set of observations. That is, there is a concern that scientific talk not be based on contact with the world that is influenced too heavily by idiosyncratic features of a given individual's history.

These methods and practices help distinguish scientific talk from other forms of discourse. Many societal institutions produce verbal products: religion, law, literature, and so on. But in these institutions there are few attempts to limit the sources of control over verbalizations to direct, verifiable, and shared contact with the world, in contrast to audience factors, states of motivation, and so on. But science is more than a matter of method.

Why Speakers Speak

Behavior analysts have much to be proud of in their commitment to methodological rigor and technological clarity. Understanding that the product of scientific research is verbal, however, also leads to an interest in the behavior of the listener—the consumers of scientific products. It is here that the limits of technological talk become evident.

The properties of verbal constructions. Verbal

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statements about relations among events can vary along four dimensions: precision, scope, organization, and depth. Precision has to do with the number of alternative verbal constructions that can be made about a given event. Scope has to do with the number of events that can be encompassed by a given verbal construction. Organization refers to the degree of systematization and coherence of given sets of verbal constructions. Depth refers to the degree to which constructions at one level of analysis (e.g., the psychological level) cohere with constructions at other levels (e.g., the anthropological or genetic level).

The nature of technological speech. The idea that what is important in applied science is the specification of empirically validated treatments in operational terms boils down to the idea that a scientific discipline can be based solely on statements high in precision but low in scope, depth, and organization. A technological statement is, if done properly, high in precision. If I say that I tested the effects of Technique X and if I have delineated the nature of Technique X carefully through the use of manuals, checks on the integrity of treatment, and so on, then there are very few alternative verbal constructions of this kind that could apply to the situation. It is unlikely, for example, that Technique X was really Technique Y. Such statements, however, are low in scope. Talk about Technique X will not necessarily apply directly to Techniques Y or Z.

Narrow constructions inherently lead to poor organization and little depth. Narrow constructions cannot become highly organized both because the number of verbal constructions proliferates and because there is little overlap between statements to guide their organization. The verbal products of other sciences will never cohere with such talk because irrelevant details are indistinguishable from fundamental processes.

An example may help. Suppose a cook experiments for several years and finally develops a new bread recipe. If this is done carefully we will have an instance of precise speech, based on verifiable experience. We could collect data on the outcome produced by the recipe, and even assess the reliability of the observations. Such a bread recipe exemplifies the characteristics of technological talk. It is highly precise, but it has little scope. It does not tell us how to bake pies or make beer. It may fail to mention or anticipate the effects of altitude, or different strains of wheat. Because recipes have little scope, cookbooks are merely collections. The total number of available recipes is always increasing. It is impossible to learn them all. There is no systematic and fundamental means to relate one recipe to another.

This same bread recipe could be described in terms of the way yeast breaks down certain compounds, the chemical properties of grain, the effect of carbon dioxide, and so on. Such constructions have much broader scope. They might indeed apply to baking pies or making beer, for example. They might suggest what the effects of altitude or grain variety might be. They could in turn be organized into systems of statements about the biological processes of organisms. Chemists or physicists would find links between their ways of speaking and that of biologists concerned with the transformation of energy.

The Limits of Technological Talk

Precision is always a plus in science. Talk that is broad in scope but very weak in precision is scientifically useless. For example, the statement "the world is the plaything of the Great Spirit" has enormous scope. Anything can be encompassed by it. But it has no precision and no scientific utility. Is it raining today because the Great Spirit is crying, or because the Great Spirit is washing? We have no way to tell, and thus an infinity of verbal constructions can apply to any given event.

Although precision is important, poor scope, depth, and organization also limit the usefulness of scientific talk for its consumers. There are several kinds of limitations such talk produces.

1. Without scientific statements with significant scope, we have no grounds to use our knowledge directly when confronted with a new problem or situation. The application of knowledge to new situations is an issue of scope, not precision. It is an issue of how many events (in this case, the new

problem itself) can be encompassed by a verbal construction. Without an adequate theory to guide us, techniques are simply thrown at new problems, without an appropriate scientifically validated rationale for their use in this new situation. An example is the rather pathetic way certain core techniques, such as relaxation training, are included in almost every package for almost every disorder.

Behavior analysts have paid an enormous amount of attention to internal validity—ways to ensure that scientific statements are based upon the data. But the consumption of scientific research is a matter of external validity. The external validity of research does not flow logically from internal validity (despite the arguments of textbooks to the contrary: see Hayes, 1988, for a discussion).

I often ask my students a key question the late Aaron Brownstein taught me to view in a different way: Why do we replicate research? Students almost invariably answer that the purpose is to see whether the same result will occur if we did the same thing. This is clearly false. We are not testing the consistency of the universe when we replicate research. If we did *exactly* the same thing in every detail, the same results would occur. Rather, our purpose is to see whether doing what the author said is doing the same thing. We are testing the functional adequacy of the researcher's verbalizations in guiding our behavior.

Unfortunately, in the applied arena even the most careful technological description cannot ensure this functional adequacy. No situation can be completely described—we have neither the language nor the time adequate to such a task. We would have to describe the dress of the experimenter, the temperature in the room, the intonations used when instructions were given, and so on, ad infinitum. Thus, any description of a study is a description only of a very small part of what was done.

The irony is that even if the technologist has no interest in the solution of *new* problems, we can never be certain that we are dealing with an *old* problem. All applications of research knowledge are applications to new problems to a degree. And there we are back to the problem of scope. The use of talk that is deliberately high in scope (e.g., talk in terms of principles of behavior) is an effort to ensure the functional adequacy or external validity of a researcher's verbalizations.

2. Without scientific statements that have significant scope, we have no systematic means to develop new techniques. Technological talk is a poor source of entirely new technology. Most of the well-known behavioral techniques were developed many years ago by persons well versed in behavioral principles. Three and four academic generations later, with more emphasis on technology and less on principles, we are seeing an almost self-stimulatory concern for technological refinements and little genuine technological innovation. Common sense is a poor source of true innovation, almost by definition: it is reasonable but expected. Whatever value common sense contains has probably already been extracted by persons with access to little else as a guide to reason. It is the uncommon sense provided by theory that is the major rational source of innovative technological development.

3. A science based purely on statements high in precision and low in scope becomes increasingly disorganized and incoherent. As we have already described, disorganization and shallowness are the natural concomitants of narrow constructions. We see the products all around us. Applied psychology is fracturing into subareas organized by commonsense categories such as patient population or clinical procedure, even though everything we know about behavior theory suggests that these divisions are scientifically trivial. Without theory, no other result is possible because no one can assimilate the mountain of seemingly disconnected bits of information that science-as-technology presents. The field becomes an incoherent mass, impossible to master and impossible to teach. In addition, the shallowness of the analysis means that other areas of science are impossible to relate to our techniques. A hole in the fabric of science opens that cannot be filled.

4. Without talk that is high in scope, the promise of behavior analysis cannot be kept. In my view, behavior analysis is that part of science studying whole organisms interacting in and with a context, and seeking the development of an increasingly organized set of empirically verified verbal rules

permitting the description, prediction, control, and interpretation of these interactions with precision, scope, and depth. From this point of view, behavior analysis is a field that spans basic and applied areas by its very nature. It is the only contemporary position in psychology that promises such an integration. Sadly, it is a promise that is being abandoned. Only a handful of people publish in both *JEAB* and *JABA*. Few even read both. In the last decade, *JEAB* has seen dozens of human studies on such extraordinary phenomena as stimulus equivalence, mutual exclusion, and rule governance, yet the *JABA* readership as a whole knows little about these developments. It is only talk that is broad in scope—theoretical talk—that permits the two areas to speak with and learn from each other.

5. Unless applied researchers show an interest in basic theoretical development, many key basic questions will never be asked. Even if applied behavior analysts carefully kept up with the basic research literature, it would not be enough. Even if *JABA* required some reasoned reference to relevant behavioral principles in every published article, it would not be enough. Applied behavior analysts cannot simply take the passive role.

Basic psychology produces a huge scientific output. As a result, there is a false sense that basic psychology is currently examining all major psychological issues of relevance to human functioning. It is not. Science is a social enterprise, subject to fads, fancies, and notable blind spots. Often, when research issues disappear, it is not because they have been solved. They simply were dropped. They went out of fashion. Other research issues are never raised, even if they might be important.

The conclusion this leads to is sobering. Even if basic behavior analysis proceeds rapidly and successfully on its agenda, there can be little reason to be confident that the issues dealt with there would be sufficient to support the full intellectual development of applied behavior analysis. If applied behavior analysis is to see the theoretical development it needs, it must not just *consume* theory but also *produce* it (see Hayes, 1987, for some reasons why). Applied behavior analysts themselves must take the responsibility to help develop the principles needed to describe ways of predicting and controlling the kinds of interactions they are studying.

There are, of course, trade-offs. Increases in scope almost always come at the cost of a loss in precision. That is best dealt with by developing both technological and theoretical constructions for given events. No loss in precision of the technological description is produced, and the considerable benefit of theory is gained: the promise of an integrated science that is systematically applicable to new situations. That's why theory is needed. *JABA* has advanced the first part of the equation. It should help advance the second.

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